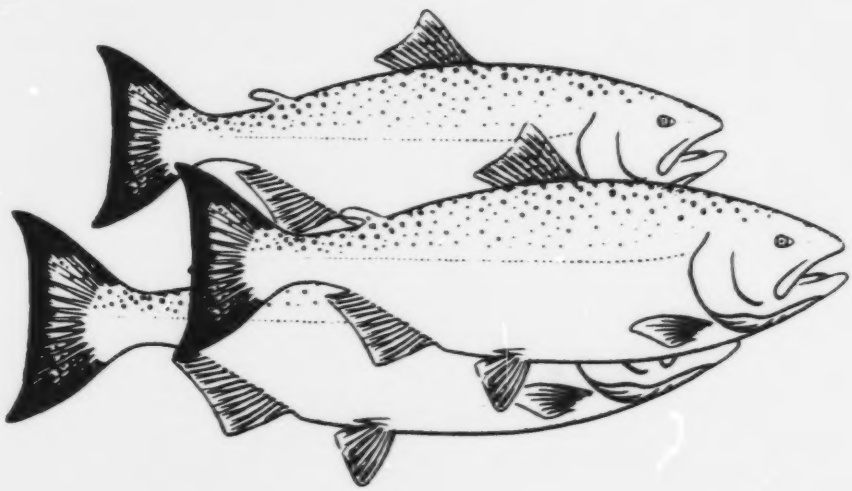
# Estimated Costs and Returns for Chinook Salmon Production in the Campbell River Area

## June 1989



Published 1989 by

**Province of British Columbia**
Ministry of Agriculture and Fisheries
Aquaculture and Commercial Fisheries Branch
Hon. John Savage, Minister

EC
A512
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**Canadian Cataloguing Information**

**Canadian Cataloguing in Publication Data**
Main entry under title:
Estimated costs and returns for Chinook salmon production in the Campbell River area

ISBN 0-7726-1015-0

1. Fish-culture - British Columbia - Campbell River Region - Costs. 2. Chinook salmon - British Columbia - Campbell River Region. I. British Columbia. Aquaculture and Commercial Fisheries Branch.

HD9469.S23C33 1989 338.3'713755 C89-092240-3

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90-00644/

**Copies of this publication may be obtained from:**

Aquaculture and Commercial Fisheries Branch
British Columbia Ministry of Agriculture and Fisheries
808 Douglas Street
Victoria, B. C.
V8W 2Z7

Aquaculture Resource Centre
North Island College
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# Acknowledgements

Recognition and thanks are extended to the salmon farmers who provided the basic data and preliminary copy follow-up suggestions and to the aquaculture supply and service firms that gave current information on the costs of salmon production inputs. Thanks also go to the Ministry of Agriculture and Fisheries staff who provided assistance at various stages in the development of this study. Completion of the study was possible only through the co-operative efforts of many people.

Peter M. Gubbels

# Introduction

## Objective

This study was prepared in response to the need for an estimate of costs and returns for chinook salmon production. It is intended to serve as a salmon farm business analysis and planning reference primarily for chinook salmon producers in the Campbell River area.

## Data Source and Methodology

The assumptions and basic data for this study were provided through the co-operative efforts of a small group of salmon farmers [1] at a June 21,1989 meeting which was organized and conducted by Dr. A. Castledine [2], Mrs. C. Hodgson [3] and Mr. P. M. Gubbels [4]. The salmon farmers specified a consensus resource base and production practices as well as the associated production costs and expected returns. Though an attempt had been made to select participants with similar operations regarding size, site characteristics, technology, and husbandry practices, there was still considerable variation which made obtaining participant consensus difficult.

Subsequent to the meeting, the data was consolidated and distributed in preliminary form to the meeting participants and other reviewers for comments and suggestions. Appropriate suggestions were then incorporated into this copy.

## Study Use

Although the study is intended as a farm management reference for comparative analysis and budgeting purposes, **it is important to recognize that it contains consensus data specified by the salmon farmers who participated in the study rather than averaged data for Campbell River area salmon farms.** Also, in view of the many differences in factors influencing profitability, it is important to realized that the data in this study is not intended to represent ideal standards. It simply stands as a set of data against which other data can be compared.

As costs and prices change over time, appropriate adjustments to the cost and price figures in this study will be required to ensure that the information is current.

Since the study was derived using specific assumptions, the information it provides can be used directly only where the specified conditons exist. Appropriate interpretation and modification is required where different conditions exist. It is obvious that each farm is a unique entity in terms of a large number of factors including site productivity, location, management, investment costs, production practices and marketing practices which result in different quantity and quality of production and different costs and returns for production. Therefore, the interpretation and proper use of the study can be a fairly complex process. For some individuals, the best use of this study will be in educational activities where appropriate explanation and guidance can be provided.

## Study Organization

As the Table of Contents indicates, after the Executive Summary, the study is organized in a sequential fashion from general to particular considerations. The General Background Information and Assumptions section describes the study analysis type and scope, the consensus farm, its physical and biological profile, the fish analysis groups and fish numbers and growth rates. Both Exhibit 1 - Summary of Capital Investment section and Exhibit 2 - Summary of Chinook Salmon Annual Costs and Returns are followed by sections providing the assumptions and calculations used to derive them. The last section, the Analysis section focusses on the study outcome, the net farm income and its interpretation. For improved understanding of the study content and to avoid misinterpretation, it is suggested that the study be approached in the sequence in which it is laid out.

[1] *Tom Pederson, Sea Venture Ltd.*
*Barbara Sharpe, Quartz Bay Sea Farm Ltd.*
*Paul Tate, Conville Point Sea Farm Ltd.*
*Don Tillapaugh, Kanish Aquafarms Ltd.*

[2] *Aquaculture Production Specialist, Aquaculture Industry Development Section, Aquaculture and Commercial Fisheries Branch*

[3] *Co-ordinator, North Island College Aquaculture Resource Centre, Campbell River, B.C.*

[4] *Aquaculture Farm Management Specialist, Aquaculture Industry Development Section, Aquaculture and Commercial Fisheries Branch*

# Executive Summary

The study was prepared from consensus data provided by a small group of salmon farmers. The farmers specified a consensus resource base and production practices as well as associated costs and expected returns based on their experience. It is not intended that the study data represent average data for Campbell River area salmon farms nor is it intended to represent ideal standards.

The consensus farm is a grow-out operation with 30,000 regular and 120,000 monosexed female chinook smolts placed each May. The farm has a fish survivability to market rate of 70 percent and an annual production of 240 tonnes of dressed salmon.

Based on the assumptions provided by the study participants, the total cash operating costs and depreciation amount to $1,692,995 or $7.06 per kilogram ($3.20 per pound) of dressed fish sold. Total returns are $1,706,589 or $7.12 per kilogram ($3.23 per pound) of dressed fish. The net farm income, the difference between the costs and returns, is $13,594 or $.057 per kilogram ($.026 per pound).

The price required to break even with all costs, including the opportunity costs specified by the study participants, is $7.94 per kilogram or $3.60 per pound of dressed fish.

The $13,594 net farm income would be insufficient to provide living expenses for the operator and it would not be possible to make any loan interest and principal payments if outside financing were involved.

To illustrate the interaction of price and one aspect of productivity, % of fish surviving to market, on net farm income a graph is provided on the following page.

## Annual Costs and Returns

| Item | $ Total | $ per kg* | % of Costs** |
|---|---|---|---|
| **Return** | 1,706,589. | 7.118 | 100.8 |
| Smolts | 90,000. | .375 | 5.3 |
| Feed | 708,843. | 2.956 | 41.9 |
| Feed delivery | 44,712. | .186 | 2.6 |
| Labour | 114,600. | .478 | 6.8 |
| Contract work | 16,400. | .068 | 1.0 |
| Veterinary and medication | 20,000. | .083 | 1.2 |
| Stock insurance | 35,000. | .146 | 2.1 |
| Transport, processing, marketing | 477,700. | 1.992 | 28.2 |
| Other | 81,516. | .340 | |
| **Total Cash Operating Costs** | 1,588,771. | 6.626 | 93.8 |
| **Depreciation** | 104,224. | .435 | 6.2 |
| **Total Cash Costs + Deprec.** | 1,692,995. | 7.061 | 100.0 |
| **NET FARM INCOME*** ** | **13,594.** | **.057** | **.8** |

*The total column figures divided by 23,9771 kilograms of dressed fish sold.

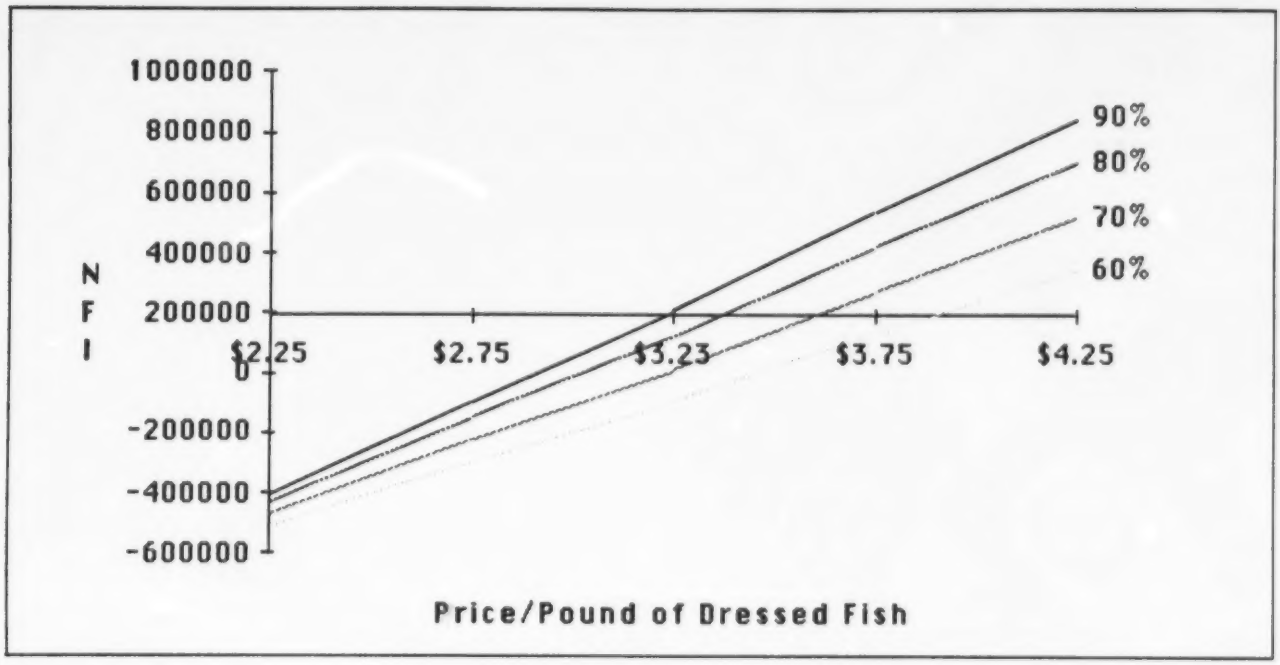
**The total column figures divided by $1,692,995., the total cash operating costs + depreciation.

*** The net farm income is the total return less total operating costs and depreciation. It is the residual return to operating cash invested, capital investment and operator labour and management. Since the study participants specified a total opportunity cost of $195,294, the net farm income shown above is deficient by $181,700.

Net farm income is on the vertical axis while price per pound of dressed fish is on the horizontal axis. Four lines represent the net farm income vs. price for four different percents of fish surviving to market. The percent of fish surviving to market is calculated by dividing the number of fish sold by the number of smolts started. e. g. 104,848 fish surviving and sold divided by 150,000 smolts started times 100 to convert to a percent = 69.9% , rounded to 70%. The horizontal axis is offset to $195,294 (the opportunity costs) in order to show a 'break even' point. The point at which each line crosses the horizontal axis is the price at which the full opportunity cost is attained for that percent of fish surviving to market. The prices required to attain a net farm income which provides the $195,294 opportunity costs specified by the study participants are as follows: $3.21 at 90%, $3.35 at 80%, $3.60 at 70% and $3.89 at 60% of fish marketed.

As can be seen, at a $3.23 per pound price, the opportunity cost is only exceeded when the percent of fish surviving to market is close to 90%, whereas, at a price of $4.25 the opportunity cost is exceeded even when the percent marketed is less than 60%.

**It is clear that the viability of a salmon farm is highly dependant on relatively small variations in salmon price levels.**




### Information Overview

**Study scope**: full farm on-going production with three year classes of fish.

**Surface temperature of site**: mean 11.5, range 7.3 to 18.7 degrees C.

**Sales rate**: 104,848 or 70% of the fish survive and are sold.

**Total capital investment**: $828,100.

**Net and seacage investment**: $595,600.

**Seacage system**: 24 - 15 X 15 metre steel units decked with wood.

**Total net water volume**: 72,000 cubic metres.

**Maximum stocking density**: 6 kilograms of fish per cubic metre.

**Average stocking density** in month of highest accumulated weight: 4.43 kilograms of fish per cubic metre.

**Fish average dressed weight**: 2.287 kilograms or 5.042 pounds.

**Total dressed weight sold**: 239,771 kilograms or 528,599 pounds.

**Weighted average price**: $7.12 per kilogram or $3.23 per pound.

**Feed:** 558,900 kilograms.

**Feed conversion**: 2.33 kg of feed :1 kg of fish dressed weight.

**Labour:** 4.5 full time equivalents.

## General Background Information and Assumptions

1. **Consensus farm:** a salmon grow-out farm located in the Campbell River area which has an on-going production of approximately 240 tonnes of dressed chinook salmon (Oncorhyncus tshawytscha) per year.

2. **Study analysis type and scope:** an economic analysis providing the annual costs and returns, as of June 21,1989, for full farm on-going production of chinook salmon in three year classes as follows:

   1 to 12 months
   13 to 24 months
   25 to 26 months

3. **Consensus farm site physical and biological profile**:

   **a)** Exposure to wind and waves:
   -maximum fetch: 2.4 kilometres.
   -maximum wave height anticipated: 0.6 metres.

   **b)** Minimum water depth below the bottom of the sea cages: 25 to 30 metres.

   **c)** Annual tidal range: mean tide 2.7 metres, large tide 4.9 metres.

   **d)** Water circulation at sea cages at a depth of 5 metres:

-slack water on a neap tide 9.6 cm/second.
-flow on a spring tide 22 to 50 cm/second.

**e)** Annual water surface temperature in degrees Celcius: mean 11.5, minimum 6.7 and maximum 18.7.

**f)** Site temperatures in degrees Celcius and salinity in parts per thousand: (see below)

**g)** Seals, otters and dogfish occur in the area and cause fish losses and damage equipment.

**h)** Chaetoceros convolutus and Heterosigma aka shiwo blooms occur occasionally between March and November.

**i)** There are no sources of water pollution that could be harmful to the fish.

4. **Site Access:** by water only.

5. **Services:** no electric power or telephone lines are provided to the site.

6. **Distance to service community:** 20 kilometres. A one way trip takes one to two hours of travel time by boat or boat and ferry.

7. **Fish stock description**:
   **a)** origin: 100% from private hatcheries.

   **b)** strain: predominantly Big Qualicum and Robertson Creek

   **c)** treatment: 20 % regular chinook and 80 % mono -sexed female chinook.

8. **Smolt placement:** Each May 150,000 smolts, made up of 30,000 regular chinook and 120,000 mono -sexed female chinook smolts, are placed in the seacages

9. **Analysis Groups:** For analysis purposes separate schedules for numbers of fish, growth, feed costs and marketing have been prepared for three fish groups: regular chinook jacks, regular chinook and monosexed female chinook. The starting number of smolts in each group is as follows:
   6,000 regular chinook jacks ( 20 % of the 30,000 regular chinooks)
   24,000 regular chinook (80% of the 30,000 regular chinooks)
   120,000 monosexed female chinook

| | DEPTH (metres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **5** | **10** |
| **Spring** | | | | | | | |
| temperature | 11.5 | 11.1 | 11.1 | 10.4 | 10.2 | 10.2 | 9.6 |
| salinity | 26.4 | 26.4 | 27.0 | 27.2 | 27.3 | 27.5 | 27.7 |
| **Summer** | | | | | | | |
| temperature | 18.7 | 16.1 | 15.8 | 15.5 | 14.6 | 14.5 | 13.2 |
| salinity | 22.8 | 23.1 | 23.4 | 24.2 | 25.2 | 25.9 | 26.9 |
| **Fall** | | | | | | | |
| temperature | 15.7 | 11.4 | 10.6 | 9.8 | 9.8 | 9.7 | 9.2 |
| salinity | 24.0 | 24.9 | 25.0 | 26.7 | 27.3 | 28.1 | 28.6 |
| **Winter** | | | | | | | |
| temperature | 7.3 | 7.3 | 7.1 | 7.0 | 6.9 | 6.8 | 6.8 |
| salinity | 26.6 | 27.0 | 27.0 | 27.0 | 27.5 | 27.5 | 27.5 |

**10. Number of fish for each analysis group:** The figures in Tables 1, 2, and 3 which follow were derived as indicated below.

**Column 2**, Start #:
-1 May - the number of fish at the start is consensus data specified by the study participants.
-2 June and subsequent months to the final sales month = column 7, End # for the previous month.

**Column 3**, Loss % - consensus data specified by the study participants.

**Column 4**, Loss # = column 2, Start # times column 3, Loss % divided by 100.

**Column 5**, Sales % - consensus data specified by the study participants.

**Column 6**, Sales # = (column 2, Start # minus column 4,Loss #) multiplied by column 5, sales % for the month divided by 100.

**Column 7**, End # = column 2, Start # minus (column 4, Loss # plus column 6, Sales #).

**Column 8**, Average # = (column 2, Start # plus column 7, End #) divided by 2.

**11. Weight of fish for each analysis group:** The figures in Tables 4, 5 and 6 which follow were derived as indicated below.

**Column 2**, Average Start (kg):
-1 May - the average weight at the start is consensus data specified by the study participants.
-2 June and subsequent months to the final sales month = column 2, Average start (kg) for the previous month plus column 4, Average Gain for the previous month.

**Column 3**, Gain % - consensus data specified by the study participants.

**Column 4**, Average Gain (kg) = Column 2, Average Start (kg) multiplied by (Column 3, Gain % divided by 100).

**Column 5**, End # - transferred from column 7 of the appropriate Number of Fish Table, i.e. Table 1,2 or 3.

**Column 6**, Accumulated Fish Weight (kg): = column 5, End # multiplied by column 2, Average Start (kg) for the <u>following month</u>. (The average start weight for the following month is the same as the average end weight for the month in question.)

# Number of Fish
# Regular Chinook-Jacks

Table: 1 Number of: REGULAR CHINOOK JACKS

| 1 Month | 2 Start # | 3 Loss % | 4 Loss # | 5 Sales % | 6 Sales # | 7 End # | 8 Average # |
|---|---|---|---|---|---|---|---|
| Apr | | | 0 | | 0 | 0 | 0 |
| 1 May | 6,000 | 2.0% | 120 | | 0 | 5,880 | 5,940 |
| 2 June | 5,880 | 2.0% | 118 | | 0 | 5,762 | 5,821 |
| 3 July | 5,762 | 2.0% | 115 | | 0 | 5,647 | 5,705 |
| 4 Aug. | 5,647 | 2.0% | 113 | | 0 | 5,534 | 5,591 |
| 5 Sept. | 5,534 | 1.0% | 55 | | 0 | 5,479 | 5,507 |
| 6 Oct. | 5,479 | 1.0% | 55 | | 0 | 5,424 | 5,451 |
| 7 Nov. | 5,424 | 0.5% | 27 | | 0 | 5,397 | 5,411 |
| 8 Dec. | 5,397 | 0.5% | 27 | | 0 | 5,370 | 5,383 |
| 9 Jan | 5,370 | 0.5% | 27 | | 0 | 5,343 | 5,357 |
| 10 Feb. | 5,343 | 4.0% | 214 | | 0 | 5,129 | 5,236 |
| 11 Mar. | 5,129 | 4.0% | 205 | | 0 | 4,924 | 5,027 |
| 12 Apr. | 4,924 | 4.0% | 197 | | 0 | 4,727 | 4,826 |
| 13 May | 4,727 | 1.0% | 47 | | 0 | 4,680 | 4,704 |
| 14 June | 4,680 | 1.0% | 47 | | 0 | 4,633 | 4,657 |
| 15 July | 4,633 | 1.0% | 46 | | 0 | 4,587 | 4,610 |
| 16 Aug | 4,587 | 1.0% | 46 | 100.0% | 4,541 | 0 | 2,293 |
| 17 Sept | 0 | | 0 | | 0 | 0 | 0 |
| 18 Oct | 0 | | 0 | | 0 | 0 | 0 |
| 19 Nov | 0 | | 0 | | 0 | 0 | 0 |
| 20 Dec | 0 | | 0 | | 0 | 0 | 0 |
| 21 Jan | 0 | | 0 | | 0 | 0 | 0 |
| 22 Feb | 0 | | 0 | | 0 | 0 | 0 |
| 23 Mar | 0 | | 0 | | 0 | 0 | 0 |
| 24 Apr | 0 | | 0 | | 0 | 0 | 0 |
| 25 May | 0 | | 0 | | 0 | 0 | 0 |
| 26 June | 0 | | 0 | | 0 | 0 | 0 |
| 27 July | 0 | | 0 | | 0 | 0 | 0 |
| 28 Aug | 0 | | 0 | | 0 | 0 | 0 |
| 29 Sept | 0 | | 0 | | 0 | 0 | 0 |
| 30 Oct | 0 | | 0 | | 0 | 0 | 0 |
| 31 Nov | 0 | | 0 | | 0 | 0 | 0 |
| 32 Dec | 0 | | 0 | | 0 | 0 | 0 |
| 33 Jan | 0 | | 0 | | 0 | 0 | 0 |
| 34 Feb | 0 | | 0 | | 0 | 0 | 0 |
| 35 Mar | 0 | | 0 | | 0 | 0 | 0 |
| 36 Apr | 0 | | 0 | | 0 | 0 | 0 |
| TOTAL | | | 1,459 | | 4,541 | | |

| | | | | | |
|---|---|---|---|---|---|
| 1,459 | (Total Loss) + | 4,541 | (Total Sales) = | 6,000 | Total |
| 1,459 | (Total Loss) / | 6,000 | (Start) = | 24.32% | Loss |
| 4,541 | (Total Sales) / | 6,000 | (Start) = | 75.68% | Sales |

# Number of Fish
# Regular Chinooks

**Table:** 2 **Number of:** REGULAR CHINOOK

| 1 Month | 2 Start # | 3 Loss % | 4 Loss # | 5 Sales % | 6 Sales # | 7 End # | 8 Average # |
|---|---|---|---|---|---|---|---|
| Apr | | | 0 | | 0 | 0 | 0 |
| 1 May | 24,000 | 2.0% | 480 | | 0 | 23,520 | 23,760 |
| 2 June | 23,520 | 2.0% | 470 | | 0 | 23,050 | 23,285 |
| 3 July | 23,050 | 2.0% | 461 | | 0 | 22,589 | 22,819 |
| 4 Aug. | 22,589 | 2.0% | 452 | | 0 | 22,137 | 22,363 |
| 5 Sept. | 22,137 | 1.0% | 221 | | 0 | 21,915 | 22,026 |
| 6 Oct. | 21,915 | 1.0% | 219 | | 0 | 21,696 | 21,806 |
| 7 Nov. | 21,696 | 0.5% | 108 | | 0 | 21,588 | 21,642 |
| 8 Dec. | 21,588 | 0.5% | 108 | | 0 | 21,480 | 21,534 |
| 9 Jan | 21,480 | 0.5% | 107 | | 0 | 21,372 | 21,426 |
| 10 Feb. | 21,372 | 4.0% | 855 | | 0 | 20,518 | 20,945 |
| 11 Mar. | 20,518 | 4.0% | 821 | | 0 | 19,697 | 20,107 |
| 12 Apr. | 19,697 | 4.0% | 788 | | 0 | 18,909 | 19,303 |
| 13 May | 18,909 | 1.0% | 189 | | 0 | 18,720 | 18,814 |
| 14 June | 18,720 | 1.0% | 187 | | 0 | 18,533 | 18,626 |
| 15 July | 18,533 | 1.0% | 185 | | 0 | 18,347 | 18,440 |
| 16 Aug. | 18,347 | 1.0% | 183 | | 0 | 18,164 | 18,256 |
| 17 Sept. | 18,164 | 2.0% | 363 | | 0 | 17,801 | 17,982 |
| 18 Oct. | 17,801 | 2.0% | 356 | | 0 | 17,445 | 17,623 |
| 19 Nov. | 17,445 | 1.0% | 174 | | 0 | 17,270 | 17,357 |
| 20 Dec. | 17,270 | 1.0% | 173 | | 0 | 17,097 | 17,184 |
| 21 Jan. | 17,097 | 1.0% | 171 | | 0 | 16,927 | 17,012 |
| 22 Feb. | 16,927 | 1.0% | 169 | 33.0% | 5,530 | 11,227 | 14,077 |
| 23 Mar. | 11,227 | 1.0% | 112 | 50.0% | 5,558 | 5,558 | 8,392 |
| 24 Apr. | 5,558 | 1.0% | 56 | 100.0% | 5,502 | 0 | 2,779 |
| 25 May | 0 | | 0 | | 0 | 0 | 0 |
| 26 June | 0 | | 0 | | 0 | 0 | 0 |
| 27 July | 0 | | 0 | | 0 | 0 | 0 |
| 28 Aug. | 0 | | 0 | | 0 | 0 | 0 |
| 29 Sept. | 0 | | 0 | | 0 | 0 | 0 |
| 30 Oct. | 0 | | 0 | | 0 | 0 | 0 |
| 31 Nov. | 0 | | 0 | | 0 | 0 | 0 |
| 32 Dec. | 0 | | 0 | | 0 | 0 | 0 |
| 33 Jan. | 0 | | 0 | | 0 | 0 | 0 |
| 34 Feb. | 0 | | 0 | | 0 | 0 | 0 |
| 35 Mar. | 0 | | 0 | | 0 | 0 | 0 |
| 36 Apr. | 0 | | 0 | | 0 | 0 | 0 |
| **TOTAL** | | | **7,411** | | **16,589** | | |

| | | | | | |
|---|---|---|---|---|---|
| 7,411 | (Total Loss) ÷ | 16,589 | (Total Sales) = | 24,000 | Total |
| 7,411 | (Total Loss) / | 24,000 | (Start) = | **30.88%** | Loss |
| 16,589 | (Total Sales) / | 24,000 | (Start) = | **69.12%** | Sales |

# Number of Fish
## Monosexed Female Chinooks

**Table:** 3 **Number of:** MONOSEXED FEMALE CHINOOK

| 1 Month | 2 Start # | 3 Loss % | 4 Loss # | 5 Sales % | 6 Sales # | 7 End # | 8 Average # |
|---|---|---|---|---|---|---|---|
| Apr | | | 0 | | 0 | 0 | 0 |
| 1 May | 120,000 | 2.0% | 2,400 | | 0 | 117,600 | 118,800 |
| 2 June | 117,600 | 2.0% | 2,352 | | 0 | 115,248 | 116,424 |
| 3 July | 115,248 | 2.0% | 2,305 | | 0 | 112,943 | 114,096 |
| 4 Aug. | 112,943 | 2.0% | 2,259 | | 0 | 110,684 | 111,814 |
| 5 Sept. | 110,684 | 1.0% | 1,107 | | 0 | 109,577 | 110,131 |
| 6 Oct. | 109,577 | 1.0% | 1,096 | | 0 | 108,482 | 109,029 |
| 7 Nov. | 108,482 | 0.5% | 542 | | 0 | 107,939 | 108,210 |
| 8 Dec | 107,939 | 0.5% | 540 | | 0 | 107,399 | 107,669 |
| 9 Jan | 107,399 | 0.5% | 537 | | 0 | 106,862 | 107,131 |
| 10 Feb. | 106,862 | 4.0% | 4,274 | | 0 | 102,588 | 104,725 |
| 11 Mar. | 102,588 | 4.0% | 4,104 | | 0 | 98,484 | 100,536 |
| 12 Apr. | 98,484 | 4.0% | 3,939 | | 0 | 94,545 | 96,515 |
| 13 May | 94,545 | 1.0% | 945 | | 0 | 93,600 | 94,072 |
| 14 June | 93,600 | 1.0% | 936 | | 0 | 92,664 | 93,132 |
| 15 July | 92,664 | 1.0% | 927 | | 0 | 91,737 | 92,200 |
| 16 Aug | 91,737 | 1.0% | 917 | | 0 | 90,820 | 91,278 |
| 17 Sept. | 90,820 | 1.0% | 908 | | 0 | 89,911 | 90,366 |
| 18 Oct. | 89,911 | 1.0% | 899 | | 0 | 89,012 | 89,462 |
| 19 Nov. | 89,012 | 1.0% | 890 | 12.5% | 11,015 | 77,107 | 83,060 |
| 20 Dec | 77,107 | 2.0% | 1,542 | 14.3% | 10,806 | 64,759 | 70,933 |
| 21 Jan | 64,759 | 2.0% | 1,295 | 16.7% | 10,579 | 52,884 | 58,822 |
| 22 Feb | 52,884 | 1.0% | 529 | 20.0% | 10,471 | 41,884 | 47,384 |
| 23 Mar | 41,884 | 1.0% | 419 | 25.0% | 10,366 | 31,099 | 36,492 |
| 24 Apr. | 31,099 | 1.0% | 311 | 33.0% | 10,160 | 20,628 | 25,864 |
| 25 May | 20,628 | 1.0% | 206 | 50.0% | 10,211 | 10,211 | 15,420 |
| 26 June | 10,211 | 1.0% | 102 | 100.0% | 10,109 | 0 | 5,105 |
| 27 July | 0 | | 0 | | 0 | 0 | 0 |
| 28 Aug. | 0 | | 0 | | 0 | 0 | 0 |
| 29 Sept. | 0 | | 0 | | 0 | 0 | 0 |
| 30 Oct. | 0 | | 0 | | 0 | 0 | 0 |
| 31 Nov | 0 | | 0 | | 0 | 0 | 0 |
| 32 Dec | 0 | | 0 | | 0 | 0 | 0 |
| 33 Jan | 0 | | 0 | | 0 | 0 | 0 |
| 34 Feb. | 0 | | 0 | | 0 | 0 | 0 |
| 35 Mar. | 0 | | 0 | | 0 | 0 | 0 |
| 36 Apr. | 0 | | 0 | | 0 | 0 | 0 |
| **TOTAL** | | | **36,282** | | **83,718** | | |

| | | | | |
|---|---|---|---|---|
| 36,282 | (Total Loss) + | 83,718 | (Total Sales) = | 120,000 Total |
| 36,282 | (Total Loss) / | 120,000 | (Start) = | **30.24%** Loss |
| 83,718 | (Total Sales) / | 120,000 | (Start) = | **69.76%** Sales |

# Fish Weight
## Regular Chinook - Jacks

Table: 4 — Weight of: REGULAR CHINOOK JACKS

| 1 Month | 2 Average Start (kg) | 3 Gain % | 4 Average Gain (kg) | 5 End # | 6 Accumulated Fish Wt. (kg) |
|---|---|---|---|---|---|
| Apr | | | 0.000 | 0 | 0 |
| 1 May | 0.007 | 100.0% | 0.007 | 5,880 | 82 |
| 2 June | 0.014 | 92.0% | 0.013 | 5,762 | 155 |
| 3 July | 0.027 | 77.0% | 0.021 | 5,647 | 269 |
| 4 Aug | 0.048 | 66.0% | 0.031 | 5,534 | 437 |
| 5 Sept | 0.079 | 53.0% | 0.042 | 5,479 | 662 |
| 6 Oct | 0.121 | 50.0% | 0.060 | 5,424 | 983 |
| 7 Nov | 0.181 | 45.0% | 0.082 | 5,397 | 1,418 |
| 8 Dec | 0.263 | 40.0% | 0.105 | 5,370 | 1,976 |
| 9 Jan | 0.368 | 30.0% | 0.110 | 5,343 | 2,556 |
| 10 Feb | 0.478 | 27.0% | 0.129 | 5,129 | 3,116 |
| 11 Mar | 0.607 | 28.0% | 0.170 | 4,924 | 3,829 |
| 12 Apr | 0.778 | 30.0% | 0.233 | 4,727 | 4,779 |
| 13 May | 1.011 | 29.0% | 0.293 | 4,680 | 6,103 |
| 14 June | 1.304 | 27.0% | 0.352 | 4,633 | 7,673 |
| 15 July | 1.656 | 24.0% | 0.397 | 4,587 | 9,419 |
| 16 Aug | 2.054 | 22.0% | 0.452 | 0 | 0 |
| 17 Sept | 2.505 | | 0.000 | 0 | 0 |
| 18 Oct | 2.505 | | 0.000 | 0 | 0 |
| 19 Nov | 2.505 | | 0.000 | 0 | 0 |
| 20 Dec | 2.505 | | 0.000 | 0 | 0 |
| 21 Jan | 2.505 | | 0.000 | 0 | 0 |
| 22 Feb | 2.505 | | 0.000 | 0 | 0 |
| 23 Mar | 2.505 | | 0.000 | 0 | 0 |
| 24 Apr | 2.505 | | 0.000 | 0 | 0 |
| 25 May | 2.505 | | 0.000 | 0 | 0 |
| 26 June | 2.505 | | 0.000 | 0 | 0 |
| 27 July | 2.505 | | 0.000 | 0 | 0 |
| 28 Aug | 2.505 | | 0.000 | 0 | 0 |
| 29 Sept | 2.505 | | 0.000 | 0 | 0 |
| 30 Oct | 2.505 | | 0.000 | 0 | 0 |
| 31 Nov | 2.505 | | 0.000 | 0 | 0 |
| 32 Dec | 2.505 | | 0.000 | 0 | 0 |
| 33 Jan | 2.505 | | 0.000 | 0 | 0 |
| 34 Feb | 2.505 | | 0.000 | 0 | 0 |
| 35 Mar | 2.505 | | 0.000 | 0 | 0 |
| 36 Apr | 2.505 | | 0.000 | 0 | 0 |

# Fish Weight
## Regular Chinooks

Table: 5 Weight of: REGULAR CHINOOK

| 1 Month | 2 Average Start (kg) | 3 Gain % | 4 Average Gain (kg) | 5 End # | 6 Accumulated Fish Wt. (kg) |
|---|---|---|---|---|---|
| Apr | | | 0.000 | 0 | 0 |
| 1 May | 0.007 | 100.0% | 0.007 | 23,520 | 329 |
| 2 June | 0.014 | 92.0% | 0.013 | 23,050 | 620 |
| 3 July | 0.027 | 77.0% | 0.021 | 22,589 | 1,075 |
| 4 Aug. | 0.048 | 66.0% | 0.031 | 22,137 | 1,748 |
| 5 Sept. | 0.079 | 53.0% | 0.042 | 21,915 | 2,648 |
| 6 Oct. | 0.121 | 43.0% | 0.052 | 21,696 | 3,749 |
| 7 Nov. | 0.173 | 35.0% | 0.060 | 21,588 | 5,036 |
| 8 Dec. | 0.233 | 31.0% | 0.072 | 21,480 | 6,564 |
| 9 Jan | 0.306 | 24.0% | 0.073 | 21,372 | 8,099 |
| 10 Feb. | 0.379 | 18.5% | 0.070 | 20,518 | 9,213 |
| 11 Mar. | 0.449 | 19.5% | 0.088 | 19,697 | 10,569 |
| 12 Apr. | 0.537 | 19.8% | 0.106 | 18,909 | 12,156 |
| 13 May | 0.643 | 22.0% | 0.141 | 18,720 | 14,682 |
| 14 June | 0.784 | 24.0% | 0.188 | 18,533 | 18,023 |
| 15 July | 0.972 | 24.0% | 0.233 | 18,347 | 22,125 |
| 16 Aug. | 1.206 | 21.0% | 0.253 | 18,164 | 26,504 |
| 17 Sept. | 1.459 | 18.0% | 0.263 | 17,801 | 30,649 |
| 18 Oct. | 1.722 | 16.0% | 0.275 | 17,445 | 34,842 |
| 19 Nov. | 1.997 | 7.5% | 0.150 | 17,270 | 37,080 |
| 20 Dec. | 2.147 | 7.0% | 0.150 | 17,097 | 39,279 |
| 21 Jan | 2.297 | 6.5% | 0.149 | 16,927 | 41,414 |
| 22 Feb. | 2.447 | 6.1% | 0.149 | 11,227 | 29,145 |
| 23 Mar. | 2.596 | 5.8% | 0.151 | 5,558 | 15,264 |
| 24 Apr. | 2.746 | 11.0% | 0.302 | 0 | 0 |
| 25 May | 3.049 | | 0.000 | 0 | 0 |
| 26 June | 3.049 | | 0.000 | 0 | 0 |
| 27 July | 3.049 | | 0.000 | 0 | 0 |
| 28 Aug. | 3.049 | | 0.000 | 0 | 0 |
| 29 Sept. | 3.049 | | 0.000 | 0 | 0 |
| 30 Oct. | 3.049 | | 0.000 | 0 | 0 |
| 31 Nov. | 3.049 | | 0.000 | 0 | 0 |
| 32 Dec. | 3.049 | | 0.000 | 0 | 0 |
| 33 Jan. | 3.049 | | 0.000 | 0 | 0 |
| 34 Feb. | 3.049 | | 0.000 | 0 | 0 |
| 35 Mar. | 3.049 | | 0.000 | 0 | 0 |
| 36 Apr. | 3.049 | | 0.000 | 0 | 0 |

# Fish Weight
## Monosexed Female Chinooks

Table: 6 — Weight of: MONOSEXED FEMALE CHINOOK

| 1 Month | 2 Average Start (kg) | 3 Gain % | 4 Average Gain (kg) | 5 End # | 6 Accumulated Fish Wt. (kg) |
|---|---|---|---|---|---|
| Apr | | | 0.000 | 0 | 0 |
| 1 May | 0.007 | 100.0% | 0.007 | 117,600 | 1,646 |
| 2 June | 0.014 | 92.0% | 0.013 | 115,248 | 3,098 |
| 3 July | 0.027 | 77.0% | 0.021 | 112,943 | 5,374 |
| 4 Aug | 0.048 | 66.0% | 0.031 | 110,684 | 8,742 |
| 5 Sept | 0.079 | 53.0% | 0.042 | 109,577 | 13,241 |
| 6 Oct | 0.121 | 43.0% | 0.052 | 108,482 | 18,745 |
| 7 Nov | 0.173 | 35.0% | 0.060 | 107,939 | 25,180 |
| 8 Dec | 0.233 | 31.0% | 0.072 | 107,399 | 32,821 |
| 9 Jan | 0.306 | 24.0% | 0.073 | 106,862 | 40,494 |
| 10 Feb | 0.379 | 18.5% | 0.070 | 102,588 | 46,066 |
| 11 Mar | 0.449 | 19.5% | 0.088 | 98,484 | 52,847 |
| 12 Apr | 0.537 | 19.8% | 0.106 | 94,545 | 60,778 |
| 13 May | 0.643 | 22.0% | 0.141 | 93,600 | 73,408 |
| 14 June | 0.784 | 24.0% | 0.188 | 92,664 | 90,115 |
| 15 July | 0.972 | 24.0% | 0.233 | 91,737 | 110,626 |
| 16 Aug | 1.206 | 21.0% | 0.253 | 90,820 | 132,518 |
| 17 Sept | 1.459 | 18.0% | 0.263 | 89,911 | 154,808 |
| 18 Oct | 1.722 | 16.0% | 0.275 | 89,012 | 177,781 |
| 19 Nov | 1.997 | 7.5% | 0.150 | 77,107 | 165,553 |
| 20 Dec | 2.147 | 7.0% | 0.150 | 64,759 | 148,775 |
| 21 Jan | 2.297 | 6.5% | 0.149 | 52,884 | 129,392 |
| 22 Feb | 2.447 | 6.1% | 0.149 | 41,884 | 108,729 |
| 23 Mar | 2.596 | 5.8% | 0.151 | 31,099 | 85,414 |
| 24 Apr | 2.746 | 11.0% | 0.302 | 20,628 | 62,887 |
| 25 May | 3.049 | 9.8% | 0.299 | 10,211 | 34,180 |
| 26 June | 3.347 | 9.0% | 0.301 | 0 | 0 |
| 27 July | 3.649 | | 0.000 | 0 | 0 |
| 28 Aug | 3.649 | | 0.000 | 0 | 0 |
| 29 Sept | 3.649 | | 0.000 | 0 | 0 |
| 30 Oct | 3.649 | | 0.000 | 0 | 0 |
| 31 Nov | 3.649 | | 0.000 | 0 | 0 |
| 32 Dec | 3.649 | | 0.000 | 0 | 0 |
| 33 Jan | 3.649 | | 0.000 | 0 | 0 |
| 34 Feb | 3.649 | | 0.000 | 0 | 0 |
| 35 Mar | 3.649 | | 0.000 | 0 | 0 |
| 36 Apr | 3.649 | | 0.000 | 0 | 0 |

**Exhibit 1**
**Summary of Capital Investment**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| **Ref.** | | **Replace.** | **Years** | **Salvage** | **Annual** | **Annual** |
| **Page*** | **Item** | **Cost*** | **Of Use** | **Value*** | **Deprec.*** | **Interest*** |
| | | $ | | $ | $ | $ |
| 11 | 1 nets | 163,600 | 5 | - | 32,720 | 9,162 |
| 12 | 2 seacage system | 432,000 | 10 | 21,600 | 41,040 | 25,402 |
| 12 | 3 moorings | 40,000 | 10 | - | 4,000 | 2,240 |
| 12 | 4 house/storage | 50,000 | 15 | 10,000 | 2,667 | 3,360 |
| 12 | 5 storage building | 30,000 | 15 | 6,000 | 1,600 | 2,016 |
| 12 | 6 boats | 27,000 | 10 | 2,700 | 2,430 | 1,663 |
| 12 | 7 boat motors | 11,000 | 3 | - | 3,667 | 616 |
| 12 | 8 feeding system | 30,000 | 5 | - | 6,000 | 1,680 |
| 12 | 9 pumps | 3,500 | 3 | - | 1,167 | 196 |
| 12 | 10 generator | 6,000 | 10 | - | 600 | 336 |
| 12 | 11 diving equipment | 10,000 | 3 | - | 3,333 | 560 |
| 12 | 12 laboratory equip. | 5,000 | 5 | - | 1,000 | 280 |
| 12 | 13 misc. equipment | 20,000 | 5 | - | 4,000 | 1,120 |
| **Totals** | | **828,100** | | **40,300** | **104,224** | **48,631** |

***Notes:**
Ref. Page - refers to the page on which details for the item can be found.
Replacement Cost - new or used cost as is typical for the study group.
Salvage Value - trade-in or remaining value when the item ceases to be used for its original purpose.
Annual Depreciation = replacement cost - salvage value / years in use.
Annual Interest = replacement cost + salvage value / 2 x the consensus opportunity cost interest rate ( June 21/89 one year Canada Treasury Bill rate of 11.2%). It is assumed that on average the items are at the mid-point of their life and capital value.

# Capital Investment Assumptions and Calculations

## 1. Nets:

The net requirements are based on a maximum stocking density of 6 kilograms of fish per cubic metre of effective water volume net space. This density is not to be exceeded by any group of fish at any time during the production cycle. Also, all fish nets are double bottomed.

**a) Small mesh net requirements:**

The nets, into which the smolts are introduced in May and remain until late fall, have dimensions of 15 X 15 X 15 metres and an effective water volume of 3,000 cubic metres.

The number of small mesh nets required, based on 15,000 to 20,000 smolts per net, is 8. In addition, 2 spare nets are needed. Therefore , the total number of small mesh nets required is **10**.

By summing the accumulated fish weight for month 6 (October) from each of tables 4, 5 and 6, it can be seen that the average density of year class 1 fish is relatively low at .98 kilograms per cubic metre of water. The calculation

is as follows: (Jacks, 983 kg + Regulars, 3,749 kg + Monosexed, 18,745 kg) divided by (8 nets X 3,000 cu. m. per net) = .98 kg per cubic metre. Similar calculations can be made for other months.

**b) Large mesh net requirements:**

The large mesh nets also have dimensions of 15 X 15 X 15 metres and effective water volume capacity of 3,000 cubic metres.

Typically, in late fall the year class 1 fish in the 8 small mesh nets are transferred to 8 large mesh nets. At this time the year class 2 fish are in 16 large mesh nets, and there are 2 spare large mesh nets. Therefore, the total number of large mesh nets required is **26**.

During the winter and spring, as some of the year class 2 fish in the 16 nets are harvested, space becomes available to split each net of year class 1 fish and transfer them to 2 nets. Grading and marketing require appropriate splitting and combining practices so as to fully utilize the nets without exceeding the maximum fish density of 6 kilograms per cubic metre of water.

Since harvesting of the year class 2 fish begins in month 19 (November), the highest accumulated weight of year class 2 fish occurs in month 18 (October).

By summing the accumulated fish weight for month 18 (October) from each of tables 5 and 6, it can be determined that the average density of year class 2 fish is 4.43 kilograms per cubic metre of water. The calculation is as follows: (Regulars, 34,842 kg + Monosexed, 177,781 kg) divided by (16 nets X 3,000 cu. m. per net) = 4.43 kg per cubic metre.

**c) Predator nets:**

Five skirt predator nets are required to enclose the seacage system.

**d) Based on the number of nets specified in a), b) and c) above, the total net replacement cost is calculated as follows:**

10 double bottom small mesh nets X $ 5,000. per net = $ 50,000.
26 double bottom large mesh nets X $ 3,600. per net = $ 93,600.
5 predator nets X $ 4000. per net = $ 20,000.

**Total = $163,600.**

**2. Seacage system:**

There was considerable variation among the study participants regarding cages. Those with lower quality, less expensive cages tended to have a larger number of cages. Conversely, those with higher quality, more expensive cages tended to have a smaller number.

The cage system that seemed to be most acceptable, at least in terms of capital cost, consists of 24 - 15 metre by 15 metre steel units decked with wood.

$18,000. per unit delivered and installed multiplied by 24 units = $ **432,000.**

**3. Moorings:**

A complete mooring system delivered and installed at the farm site = $ **40,000.**

**4. House/storage building:**

A floating house/storage building delivered to the farm site = $ **50,000.**

**5. Storage building:**

A floating storage building delivered to the farm site = $ **30,000.**

**6. Boats:**

A welded aluminum 18 foot crew boat = $ 17,000.
A 25 by 8 foot herring skiff = $ 10,000.
**Total = $ 27,000.**

**7. Boat motors:**

A 35 horsepower outboard for the skiff = $ 4,000.
A 100 horsepower outboard for the crew boat = $ 7,000.
**Total = $ 11,000.**

**8. Feeding system:**

All the small fish are hand fed. The fish over 1 year old are fed using a combination of hand feeding and 10 automatic feeders.

$3,000 per automatic feeder multiplied by 10 feeders = $ **30,000.**

**9. Water pumps:**

A small pump at a cost of $ 1,000.
A larger pump at a cost of $ 2,500.
**Total $ 3,500.**

**10. Generator:**

A 5 kilowatt diesel generator = $ **6,000.**

**11. Diving equipment:**

Components of the diving equipment include suits, regulators, gauges, tanks, buoyancy, masks and fins = $ **10,000.**

**12. Laboratory equipment:**

Components of the laboratory equipment include microscope, thermometers, sechi disk, dissolved oxygen meter = $ **5,000.**

**13. Miscellaneous equipment:**

Components of the miscellaneous equipment include power tools, hand tools, totes, scales, dip nets, pallet jack = $ **20,000.**

## Exhibit 2
## Summary of Chinook Salmon Annual Costs and Returns

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Ref. Page* | Item | Item Description | $ Total | $ Per kg** | % of Op. Costs & Depr*** |
| 14 | 1. | **RETURN** | 1,7065,89. | 7.118 | 100.8 |
| 16 | 2. | Smolts | 90,000. | .375 | 5.3 |
| 16 | 3. | Feed | 708,843. | 2.956 | 41.9 |
| 20 | 4. | Feed delivery | 44,712. | .186 | 2.6 |
| 20 | 5. | Labour | 114,600. | .478 | 6.8 |
| 21 | 6. | Contract work | 16,400. | .068 | 1.0 |
| 21 | 7. | General Insurance | 10,000. | .042 | 0.6 |
| 21 | 8. | Repair and maintenance | 16,980. | .071 | 1.0 |
| 21 | 9. | Fuel | 10,000. | .042 | 0.6 |
| 22 | 10. | Veterinary and medication | 20,000. | .083 | 1.2 |
| 22 | 11. | Leases/licences | 10,000. | .042 | 0.6 |
| 22 | 12. | Utilities (communication) | 12,000. | .050 | 0.7 |
| 22 | 13. | Accounting and legal | 8,000. | .033 | 0.5 |
| 22 | 14. | Miscellaneous | 14,536. | .061 | 0.9 |
| 22 | 15. | Stock Insurance | 35,000. | .146 | 2.1 |
| 22 | 16. | Transport, processing, marketing | 477,700. | 1.992 | 28.2 |
| 22 | 17. | **TOT. CASH OPER. COSTS** (sum of items 2 to 16) | 1,5588,771. | 6.626 | 93.8 |
| 22 | 18. | **Depreciation** | 104,224. | .435 | 6.2 |
| 22 | 19. | **TOTAL CASH OPERATING COSTS + DEPRECIATION** (17 + 18) | 1,692,995. | 7.061 | 100.0 |
| 22 | 20. | **NET FARM INCOME** (1 - 19) | **13,594.** | **.057** | **.8** |

*For detailed information on an item, refer to the page given.

**Column 4 figures divided by 239,771 kilograms of dressed fish sold.

***Column 4 figures divided by $ 1,692,995., the total cash operating costs + depreciation (item 19) times 100.

# Costs and Returns Assumptions and Calculations

**1. Return:**
**Assumptions:**

Fish harvesting is evenly distributed throughout each month selected for harvest; thus, the weight of fish harvested can be calculated by using the average weight for the month data.

The harvested fish are transported live, custom processed and sold through a broker.

The basis for fish price is dressed, head on, gills out, boxed and f.o.b. Vancouver, B.C. The unit for dressed product price is pounds.

Weighted average prices are used rather than separate prices for first grade and second grade fish. The consensus fish prices provided by the study participants are as follows: less than 4 lb. - $ 2.80 per lb., 4 to 6 lb. - $ 3.25 per lb. and over 6 lb. - $ 3.60 per lb.

The dressout yield factor for all fish sold is .86.

**Calculations:**

**a) regular chinook-jacks**

The average live weight of jacks harvested in August (see table 4) = (2.054 + 2.505 kg) / 2 X 2.2046 lb. per kg. = 5.03 lb.

4541 jacks sold (see table 1) X 5.03 lb. average live weight X .86 dressout yield factor = 19,643 lb. dressed weight.

**a) regular chinook-jacks**

| Dressed Wt.Ranges lb. | In Wt. Range* % | Dressed Fish** lb. | Price/lb. $ | Return $ |
|---|---|---|---|---|
| < 4 | 25 | 4,911 | 2.80 | 13,751. |
| 4 - 6 | 60 | 11,786 | 3.25 | 38,304. |
| > 6 | 15 | 2,946 | 3.60 | 10,606. |
| **Total** | **100** | **19643** | | **62,661.** |

*Estimated % dressed fish weight expected in the various ranges.
** 19,643 total pounds dressed weight X % in weight range / 100.

**b) regular chinooks**

| Harvest Month * | Avg. Wt. Beginning* kg | Avg. Wt. End* kg | Average Harvest Wt. kg | No. of fish Harvested** | Live Wt. Harvested kg |
|---|---|---|---|---|---|
| 22 Feb. | 2.447 | 2.596 | 2.522 | 5,530 | 13,947 |
| 23 Mar. | 2.596 | 2.746 | 2.671 | 5,558 | 14,845 |
| 24 Apr. | 2.746 | 3.049 | 2.898 | 5,502 | 15,945 |
| | | | **Total** | **16,590** | **44,737** |

* From Table 5.
** From Table 2.

The average live weight of regular chinooks harvested = 44,737 kg. / 16,590 fish X 2.2 046 lb. per kg. = 5.95 lb.

16,590 regular chinooks sold X 5.95 lb. average live weight X .86 dressout yield factor = 84,891 lb. dressed weight.

**b) regular chinooks cont.**

| Dressed Wt.Ranges lb. | In Wt. Range* % | Dressed Fish** lb. | Price/lb. $ | Return $ |
|---|---|---|---|---|
| < 4 | 20 | 16,978 | 2.80 | 47,538. |
| 4 - 6 | 60 | 50,935 | 3.25 | 165,539. |
| > 6 | 20 | 16,978 | 3.60 | 61,121. |
| **Total** | **100** | **84,891** | | **274,198.** |

*Estimated % dressed fish weight expected in the various ranges.

** 84,891 total pounds dressed weight X % in weight range / 100.

**c) Monosexed female chinooks**

| Harvest Month * | Avg. Wt. Beginning* kg | Avg. Wt. End* kg | Average Harvest Wt. kg | No. of fish Harvested** | Live Wt. Harvested kg |
|---|---|---|---|---|---|
| 19 Nov. | 1.997 | 2.147 | 2.072 | 11,015 | 22,823 |
| 20 Dec. | 2.147 | 2.297 | 2.222 | 10,806 | 24,011 |
| 21 Jan. | 2.297 | 2.447 | 2.372 | 10,579 | 25,093 |
| 22 Feb. | 2.447 | 2.596 | 2.522 | 10,471 | 26,408 |
| 23 Mar. | 2.596 | 2.746 | 2.671 | 10,366 | 27,688 |
| 24 Apr. | 2.746 | 3.049 | 2.898 | 10,160 | 29,444 |
| 25 May | 3.049 | 3.347 | 3.198 | 10,211 | 32,655 |
| 26 June | 3.347 | 3.649 | 3.498 | 10,109 | 35,361 |
| | | | **Total** | **83,718** | **223,483** |

*From Table 6.

**From Table 3.

The average live weight of monosexed female chinooks harvested
= 223,483 kg. / 83,718 fish X 2.2046 lb. per kg. = 5.89 lb.
83,718 monosexed female chinooks sold X 5.89 lb. average live weight X .86 dressout yield factor
= 424,065 lb. dressed weight.

**c) Monosexed female chinooks cont.**

| Dressed Wt.Ranges lb. | In Wt. Range* % | Dressed Fish** lb. | Price/lb. $ | Return $ |
|---|---|---|---|---|
| < 4 | 20 | 84,813 | 2.80 | 237,476. |
| 4 - 6 | 60 | 254,439 | 3.25 | 826,927. |
| > 6 | 20 | 84,813 | 3.60 | 305,327. |
| **Total** | **100** | **424,065** | | **1,369,730.** |

*Estimated % dressed fish weight expected in the various ranges.
** 424,065 total pounds dressed weight X % in weight range / 100.

**d) The summary dressed weight of fish sold and the total return from a), b) and c) above is as follows:**

| | Total Dressed Weight lb. | Total Returns $ |
|---|---|---|
| **Regular chinook-jacks** | 19,643 | 62,661. |
| **Regular chinooks** | 84,891 | 274,198. |
| **Monosexed female chinooks** | 424,065 | 1,369,730. |
| **Total** | **528,599*** | **1,706,589.** |

*528,599 lb. / 2.2046 lb. per kg = 239,771 kg

The weighted average price for all fish sold = $1,706,589 / 528,599 lb. = $3.23 per lb. or $ 7.12 per kg.

**2. Smolts:**
The cost for 7 gram smolts including delivery to the farm is $ .60 each.
150,000 smolts X $ .60 = **$ 90,000.**

**3. Feed:**

| Type | Months Fed | Cost/kg |
|---|---|---|
| starter | 1 to 2 | $ 1.50 |
| grower* | 3 to 5 | $ 1.17 |
| grower** | 6 to harvest | $ 1.27 |

*unpigmented ** pigmented

**The figures in Tables 7, 8 and 9 which follow were derived as indicated below.**

**Column 2**, Total kg Gain = Avg. # (from column 8 of appropriate table 1, 2 or 3) X Average Gain (kg) (from column 4 of appropriate table 4, 5 or 6).

**Column 3**, Feed Utilization - consensus data specified by the study group.

**Column 4**, Total Feed (kg) = Column 2, Total kg Gain X Column 3, Feed Utilization.

**Column 5**, Feed Cost per kg - consensus data specified by the study group.

**Column 6**, Total Feed Cost = Column 4, Total Feed (kg) X Column 5, Feed Cost per kg.

# Total Feed Cost
## Regular Chinook - Jacks

Table: 7 — Total Feed Cost for: REGULAR CHINOOK JACKS

| 1 Month | 2 Total Gain (kg) | 3 Feed Utilization | 4 Total Feed (kg) | 5 Feed Cost per kg ($) | 6 Total Feed Cost ($) |
|---|---|---|---|---|---|
| Apr | 0 | | 0 | | 0.00 |
| 1 May | 42 | 1.50 | 62 | 1.50 | 93.56 |
| 2 June | 75 | 1.50 | 112 | 1.50 | 168.70 |
| 3 July | 118 | 1.50 | 177 | 1.17 | 207.22 |
| 4 Aug | 176 | 1.50 | 263 | 1.17 | 308.10 |
| 5 Sept | 230 | 1.50 | 346 | 1.17 | 404.52 |
| 6 Oct | 329 | 1.50 | 494 | 1.27 | 627.45 |
| 7 Nov | 441 | 1.80 | 794 | 1.27 | 1,008.84 |
| 8 Dec | 566 | 1.80 | 1,019 | 1.27 | 1,293.78 |
| 9 Jan | 591 | 1.80 | 1,064 | 1.27 | 1,351.67 |
| 10 Feb | 676 | 1.80 | 1,217 | 1.27 | 1,545.94 |
| 11 Mar | 855 | 1.80 | 1,539 | 1.27 | 1,954.62 |
| 12 Apr | 1,126 | 1.80 | 2,026 | 1.27 | 2,573.40 |
| 13 May | 1,379 | 1.80 | 2,482 | 1.27 | 3,152.07 |
| 14 June | 1,639 | 1.80 | 2,951 | 1.27 | 3,747.89 |
| 15 July | 1,832 | 1.80 | 3,298 | 1.27 | 4,188.64 |
| 16 Aug | 1,036 | 1.80 | 1,865 | 1.27 | 2,368.58 |
| 17 Sept | 0 | | 0 | | 0.00 |
| 18 Oct | 0 | | 0 | | 0.00 |
| 19 Nov | 0 | | 0 | | 0.00 |
| 20 Dec | 0 | | 0 | | 0.00 |
| 21 Jan | 0 | | 0 | | 0.00 |
| 22 Feb | 0 | | 0 | | 0.00 |
| 23 Mar | 0 | | 0 | | 0.00 |
| 24 Apr | 0 | | 0 | | 0.00 |
| 25 May | 0 | | 0 | | 0.00 |
| 26 June | 0 | | 0 | | 0.00 |
| 27 July | 0 | | 0 | | 0.00 |
| 28 Aug | 0 | | 0 | | 0.00 |
| 29 Sept | 0 | | 0 | | 0.00 |
| 30 Oct | 0 | | 0 | | 0.00 |
| 31 Nov | 0 | | 0 | | 0.00 |
| 32 Dec | 0 | | 0 | | 0.00 |
| 33 Jan | 0 | | 0 | | 0.00 |
| 34 Feb | 0 | | 0 | | 0.00 |
| 35 Mar | 0 | | 0 | | 0.00 |
| 36 Apr | 0 | | 0 | | 0.00 |
| TOTAL | 11,112 | | 19,711 | | 24,994.98 |

| Total Feed (kg)/ | Total Weight Gain (kg) | = kg feed per kg of fish live weight gain |
|---|---|---|
| 19,711 | 11,112 | 1.77 |

# Total Feed Cost
## Regular Chinooks

Table: 8 — Total Feed Cost for: REGULAR CHINOOK

| 1 Month | 2 Total Gain (kg) | 3 Feed Utilization | 4 Total Feed (kg) | 5 Feed Cost per kg ($) | 6 Total Feed Cost ($) |
|---|---|---|---|---|---|
| Apr | 0 | | 0 | | 0.00 |
| 1 May | 166 | 1.50 | 249 | 1.50 | 374.22 |
| 2 June | 300 | 1.50 | 450 | 1.50 | 674.79 |
| 3 July | 472 | 1.50 | 708 | 1.17 | 828.89 |
| 4 Aug | 702 | 1.50 | 1,053 | 1.17 | 1,232.39 |
| 5 Sept | 922 | 1.50 | 1,383 | 1.17 | 1,618.09 |
| 6 Oct | 1,133 | 1.50 | 1,700 | 1.27 | 2,158.44 |
| 7 Nov | 1,309 | 1.80 | 2,356 | 1.27 | 2,992.14 |
| 8 Dec | 1,557 | 1.80 | 2,803 | 1.27 | 3,559.85 |
| 9 Jan | 1,571 | 1.80 | 2,829 | 1.27 | 3,592.32 |
| 10 Feb | 1,468 | 1.80 | 2,643 | 1.27 | 3,356.56 |
| 11 Mar | 1,761 | 1.80 | 3,169 | 1.27 | 4,024.82 |
| 12 Apr | 2,051 | 1.80 | 3,692 | 1.27 | 4,688.31 |
| 13 May | 2,661 | 1.80 | 4,790 | 1.27 | 6,082.73 |
| 14 June | 3,506 | 1.80 | 6,311 | 1.27 | 8,014.61 |
| 15 July | 4,304 | 1.80 | 7,747 | 1.27 | 9,838.73 |
| 16 Aug | 4,623 | 1.80 | 8,321 | 1.27 | 10,568.28 |
| 17 Sept | 4,723 | 1.80 | 8,501 | 1.27 | 10,796.68 |
| 18 Oct | 4,855 | 1.80 | 8,739 | 1.27 | 11,098.02 |
| 19 Nov | 2,600 | 1.90 | 4,940 | 1.27 | 6,273.93 |
| 20 Dec | 2,583 | 1.90 | 4,907 | 1.27 | 6,231.90 |
| 21 Jan | 2,540 | 1.90 | 4,827 | 1.27 | 6,129.92 |
| 22 Feb | 2,101 | 1.90 | 3,992 | 1.27 | 5,069.60 |
| 23 Mar | 1,264 | 1.90 | 2,401 | 1.27 | 3,049.07 |
| 24 Apr | 840 | 1.90 | 1,595 | 1.27 | 2,025.73 |
| 25 May | 0 | | 0 | | 0.00 |
| 26 June | 0 | | 0 | | 0.00 |
| 27 July | 0 | | 0 | | 0.00 |
| 28 Aug | 0 | | 0 | | 0.00 |
| 29 Sept | 0 | | 0 | | 0.00 |
| 30 Oct | 0 | | 0 | | 0.00 |
| 31 Nov | 0 | | 0 | | 0.00 |
| 32 Dec | 0 | | 0 | | 0.00 |
| 33 Jan | 0 | | 0 | | 0.00 |
| 34 Feb | 0 | | 0 | | 0.00 |
| 35 Mar | 0 | | 0 | | 0.00 |
| 36 Apr | 0 | | 0 | | 0.00 |
| TOTAL | 50,012 | | 90,105 | | 114,280.02 |

| Total Feed (kg)/ | Total Weight Gain (kg) | = kg feed per kg of fish live weight gain |
|---|---|---|
| 90,105 | 50,012 | 1.80 |

# Total Feed Cost
# Monosexed Female Chinooks

Table: 9 — Total Feed Cost for: MONOSEXED FEMALE CHINOOK

| 1 Month | 2 Total Gain (kg) | 3 Feed Utilization | 4 Total Feed (kg) | 5 Feed Cost per kg ($) | 6 Total Feed Cost ($) |
|---|---|---|---|---|---|
| Apr | 0 | | 0 | | 0.00 |
| 1 May | 832 | 1.50 | 1,247 | 1.50 | 1,871.10 |
| 2 June | 1,500 | 1.50 | 2,249 | 1.50 | 3,373.97 |
| 3 July | 2,362 | 1.50 | 3,542 | 1.17 | 4,144.44 |
| 4 Aug | 3,511 | 1.50 | 5,267 | 1.17 | 6,161.95 |
| 5 Sept | 4,610 | 1.50 | 6,915 | 1.17 | 8,090.44 |
| 6 Oct | 5,665 | 1.50 | 8,498 | 1.27 | 10,792.18 |
| 7 Nov | 6,544 | 1.80 | 11,780 | 1.27 | 14,960.68 |
| 8 Dec | 7,786 | 1.80 | 14,015 | 1.27 | 17,799.25 |
| 9 Jan | 7,857 | 1.80 | 14,143 | 1.27 | 17,961.62 |
| 10 Feb | 7,342 | 1.80 | 13,215 | 1.27 | 16,782.79 |
| 11 Mar | 8,803 | 1.80 | 15,846 | 1.27 | 20,124.10 |
| 12 Apr | 10,254 | 1.80 | 18,458 | 1.27 | 23,441.54 |
| 13 May | 13,304 | 1.80 | 23,948 | 1.27 | 30,413.67 |
| 14 June | 17,530 | 1.80 | 31,554 | 1.27 | 40,073.05 |
| 15 July | 21,520 | 1.80 | 38,735 | 1.27 | 49,193.67 |
| 16 Aug | 23,115 | 1.80 | 41,607 | 1.27 | 52,841.38 |
| 17 Sept | 23,734 | 1.80 | 42,721 | 1.27 | 54,256.02 |
| 18 Oct | 24,645 | 1.80 | 44,362 | 1.27 | 56,339.45 |
| 19 Nov | 12,442 | 1.90 | 23,640 | 1.27 | 30,022.37 |
| 20 Dec | 10,661 | 1.90 | 20,256 | 1.27 | 25,724.59 |
| 21 Jan | 8,784 | 1.90 | 16,689 | 1.27 | 21,195.18 |
| 22 Feb | 7,072 | 1.90 | 13,437 | 1.27 | 17,064.80 |
| 23 Mar | 5,494 | 1.90 | 10,439 | 1.27 | 13,257.90 |
| 24 Apr | 7,814 | 1.90 | 14,846 | 1.27 | 18,854.68 |
| 25 May | 4,607 | 1.90 | 8,753 | 1.27 | 11,116.20 |
| 26 June | 1,538 | 1.90 | 2,922 | 1.27 | 3,711.41 |
| 27 July | 0 | | 0 | | 0.00 |
| 28 Aug | 0 | | 0 | | 0.00 |
| 29 Sept | 0 | | 0 | | 0.00 |
| 30 Oct | 0 | | 0 | | 0.00 |
| 31 Nov | 0 | | 0 | | 0.00 |
| 32 Dec | 0 | | 0 | | 0.00 |
| 33 Jan | 0 | | 0 | | 0.00 |
| 34 Feb | 0 | | 0 | | 0.00 |
| 35 Mar | 0 | | 0 | | 0.00 |
| 36 Apr | 0 | | 0 | | 0.00 |
| TOTAL | 249,326 | | 449,084 | | 569,568.43 |

| Total Feed (kg)/ | Total Weight Gain (kg) | = kg feed per kg of fish live weight gain |
|---|---|---|
| 449,084 | 249,326 | 1.80 |

**A summary of the amount of feed used and the feed costs is as follows:**

| Fish Group | Source of Data | Total Feed (kg) | Total Feed Cost |
|---|---|---|---|
| **Regular chinook-jacks** | Table 7 | 19,711 | 24,995. |
| **Regular chinooks** | Table 8 | 90,105 | 114,280. |
| **Monosexed Female chinooks** | Table 9 | 449,084 | 569,568. |
| **Total** | | **558,900** | **$ 708,843.** |

**4. Feed delivery:**

The feed is delivered to the farm from Vancouver at $ .08 per kilogram.
558,900 kg of feed (from point 3 above) X $ .08 per kilogram = **$ 44,712.**

**5. Labour:**

**a) Estimated time allocation:**

| Operation | % |
|---|---|
| feed handling and feeding | 48 |
| diving | 10 |
| net changing | 10 |
| net cleaning | 10 |
| inventory measuring/splitting | 5 |
| monitoring/sampling | 5 |
| harvesting | 5 |
| repairing and maintaining | 5 |
| record keeping | 2 |
| **Total** | **100** |

**b) Employee cost calculations:**

| # of employees | rate/ month | # of months | earnings | CPP,UIC WCB* | Med** | R & B*** | Cost |
|---|---|---|---|---|---|---|---|
| | $ | | $ | $ | $ | $ | $ |
| 2 | 1,500 | 12 | 36,000. | 2,880. | 1,680. | 4,800. | 45,360. |
| 2 | 2,000 | 12 | 48,000. | 3,840. | 1,680. | 4,800. | 58,320. |
| 1 | 1,500 | 6 | 9,000. | 720. | - | 1,200. | 10,920. |
| **TOTALS** | | | **93,000.** | **7,440.** | **3,360.** | **10,800.** | **114,600.** |

*Employer Canada Pension Plan, Unemployment Insurance Commission and Workers' Compensation Board contributions on behalf of employees at 8 % of earnings.

**Employer Medical and Dental Plan payments on behalf of regular employees at $70. per month per employee.

*** The employer cost of providing employee room and board at $200. per month per employee.

**6. Contract work:**

| | | |
|---|---|---|
| Environmental monitoring | | $ 2,000. |
| Net washing 24 nets X 3 times per year X $200. per net | | $ 14,400. |
| | **Total** | **$ 16,400.** |

**7. General Insurance:**

Total vehicle, fire and liability insurance = **$ 10,000.**

**8. Repair and maintenance:**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| | | **Replace** | **Repair &** | **Annual Repair** |
| **Line** | **Item** | **Cost*** | **Maint.** | **& Maintenance** ** |
| | $ | | % | $ |
| 1 | nets | 163,600. | - | - |
| 2 | seacage system | 432,000. | 0 .5 | 2,160. |
| 3 | moorings | 40,000. | 10 | 4,000. |
| 4 | house/storage | 50,000. | 1 | 500. |
| 5 | storage bldg. | 30,000. | 1 | 300. |
| 6 | boats | 27,000. | 1 | 270. |
| 7 | boat motors | 11,000. | 25 | 2,750. |
| 8 | feeding system | 30,000. | 5 | 1,500. |
| 9 | pumps | 3,500. | 10 | 350. |
| 10 | generator | 6,000. | 10 | 600. |
| 11 | diving equipment | 10,000. | 3 | 300. |
| 12 | laboratory equip. | 5,000. | 5 | 250. |
| 13 | misc. equip. | 20,000. | 10 | 2,000. |
| | truck (leased) | | | 2,000. |
| | | **Total** | | **$ 16,980.** |

* Source: see Summary of Capital Investment.
** Replacement cost X % Repair and Maintenance / 100.

**9. Fuel:**

| | $ |
|---|---|
| Diesel fuel | 2,000. |
| Propane | 2,000. |
| Boat gasoline | 4,000. |
| Truck gasoline | 2,000. |
| **Total** | **10,000.** |

**10. Veterinary and medication:**

| | |
|---|---|
| Veterinary services | **$ 2,000.** |
| Medications | **18,000.** |
| **Total** | **$ 20,000.** |

**11. Leases/licences:**

| | |
|---|---|
| Upland lease, water lease and property taxes | **$ 6,000.** |
| Aquaculture license | **200.** |
| Other | **3,800.** |
| **Total** | **$ 10,000.** |

**12. Utilities:**

Communication - $1,000. per month X 12 months = **$ 12,000.**

**13. Accounting and legal fees:**

Average annual cost = **$ 8,000.**

**14. Miscellaneous:**

| | |
|---|---|
| B. C. Salmon Farmers' Association tariff $.02 per dressed pound of fish sold X 528,599 pounds | **$10,536.** |
| Business expenses re: meetings, conventions, etc | **4,000.** |
| **Total** | **$ 14,536.** |

**15. Stock Insurance:**

An estimated average fish stock value of $ 1,000,000. throughout the year X 3.5% = **$ 35,000.**

**16. Transport, processing and marketing:**

| | |
|---|---|
| Fish live transport, unloading, bleeding, dressing, boxing and f.o.b. Vancouver at $ .71 per pound X 528,599 pounds of dressed fish sold (see point 1 d) above) | **$ 375,305.** |
| Brokerage fee of 6% X $ 1,706,589. total return from dressed fish sold (see point 1 d) above) | **102,395.** |
| **Total** | **$ 477,700.** |

**17. Total Cash Operating Costs:**

The sum of the totals for items 2 to 16 above.

**18. Depreciation:**

See the Summary of Capital Investment on page 11.

**19. Total Cash Operating Costs and Depreciation:**

The sum of the totals for items 17 and 18.

**20. Net Farm Income:**

The net farm income is calculated by subtracting the total cash operating costs and depreciation from the total return. i.e. item 1 - minus item 19).

The net farm income is the residual return to operator labour, management, and investment.

Since the net farm income in this study is positive, it means that the return received covers the cash operating costs and depreciation. However, because the net farm income is very low, it does not provide an adequate return to operating cash invested, capital investment, operator labour or management.

A low net farm income is due to inadequate returns and / or high costs. These will need to be checked in detail in order to determine the main cause or causes of the inadequate net farm income.

# Analysis

**a) Inadequacy of the Net Farm Income**

The net farm income,as shown on Exhibit 2 - Summary of Chinook Salmon Annual Costs and Returns, is the total return less total operating costs and depreciation. Alternatively, the net farm income is the residual return to operating cash invested, capital investment, and operator labour and management. The $13,594 net farm income generated by the consensus study farm does not provide an adequate return to investment and operator labour and managment. Illustrating the degree to which the net farm income falls short of what would be acceptable to the study participants involves taking into account the opportunity costs. Opportunity costs can be defined as the value of the opportunities foregone by choosing one business option over another. In the case of the salmon farmers, the opportunity costs are the value of their labour, management, and investment in an alternative endeavour which is foregone because of the decision to engage in the business of salmon production. The extent to which the net farm income fails to meet the opportunity costs specified by the study participants is shown below.

| | $ |
|---|---|
| Net farm income | **13,594.** |
| Interest on cash operating costs | **91,663.*** |
| Interest on capital investment | **48,631.**** |
| Operator labour and management | **55,000.***** |
| Less total opportunity costs | **195,294.** |
| | **-181,700.** |

The net farm income is deficient by $181,700.

*The opportunity cost interest rate specified by the group for determining the interest on cash operating costs was the June 21/89 Bank Prime Rate of 13.5% + 3% or 16.5%. Based on the assumption that the operating cost items 2 to 15 are fairly evenly distributed throughout the year and must be carried to the end of the year and that the interest on the average of these operating costs is approximately equal to the interest on the accumulating cash costs over the year, the interest on the cash operating costs is calculated as follows:

The sum of items 2 to 15 on Exhibit 2 - Summary of Chinook Salmon Annual Costs and Returns, $1,111,071 / 2 X the imputed interest rate of .165 = $91,663. This is a relatively rough estimate, but to refine it would require a cash flow which was not determined for this study.

**Source: see column 7 total on Exhibit 2 - Summary of Capital Investment.

***The study participants specified an imputed operator labour and management opportunity cost of $50,000 plus 10% benefits or $55,000 in total.

**b) Implications of the Low Net Farm Income**

The net farm income of $13,594 and its failure by $181,700 to meet the expected opportunity costs is indicative of the results obtained when the operator provides his own labour and management and funds to operate the business. Even if the operator were willing over the short run to forego a return on his investment, the $13,594 would almost certainly be insufficient to cover living expenses. If outside financing were involved, the situation would be much more serious because there would be no way to meet loan interest and principal obligations.

**c) Identification of the Causes for the Low Net Farm Income**

The net farm income can only be inadequate if the costs are too high and/or the returns are too low.

In regard to both capital and operating costs, each of the individual costs needs to be questioned. Could any of them be reduced in terms of the input amount or the per unit cost without decreasing production? Could any of the costs be increased and result in comparatively higher returns. To maximize profits, the amount of each variable resource to produce the product should be at the point where the value of the added product just equals the cost of the added resource used to produce it. Is there an appropriate balance within the group of capital costs, within the group of operating costs and between the groups?

The analysis of the costs could be facilitated by the application of economic principles mainly through the partial budgetting process. However, even if the cost levels and structure could be improved, the major cause for the low net farm income appears to be inadequate returns rather than high costs.

Since the returns are composed of price times the quantity/quality of product produced, all factors associated with price and quantity/quality of product need to be examined and questioned.

In regard to prices, salmon is an international product and salmon producers realize that individually they cannot influence prices set on the international market. The prices used in this study are low in relation to prices anticipated at the time the production was being planned: consequently the returns are much lower than anticipated. Within the frame of reference of internationally established prices, however, salmon producers can still question some price factors over which they can have some control. For example, since larger fish have a higher per unit price, would it pay to produce fish of a larger size? As prices tend to have seasonal variation, would it pay to target marketing in the high price periods? Could higher prices be obtained from alternative markets or through alternative marketing agencies? Would price and volume contracts reduce the risk and provide an acceptable return? Since markets and marketing processes are dynamic, the above questions need to be continually explored in an attempt to achieve higher prices.

In addition to prices, the quantity and quality of product produced impacts directly on returns. Again, to analyse the alternative ways to improve product quantity and quality, a series of questions can be asked. Has the best fish stock been selected for the site bio-physical environment? Could alternative feed or medications improve the growth rate and/or survivability rate? Could any of the husbandry practices be changed to increase product quantity and/or improve product quality? Would it pay to increase the stocking density in the same net pen space by raising a larger number of fish or retaining the present number of fish for a longer period in order to produce a larger quantity of product? These questions and others need to be checked in order to determine if an attempt to produce an increased volume of fish and/or improved quality of fish would pay.

To illustrate the interaction of price and one aspect of productivity, percent of fish surviving to market, on net farm income, the following is provided.

**Net Farm Incomes for Alternative Prices and Percent of Fish Surviving to Market***

| Percent of Fish Surviving to Market | | | | | |
|---|---|---|---|---|---|
| 90 | -410,095 | -94,316 | 208,832 | 537,243 | 853,023 |
| 80 | -432,734 | -147,785 | 125,767 | 422,115 | 707,065 |
| 70 | -472,612 | -224,172 | 13,594** | 272,711 | 521,153 |
| 60 | -507,902 | -293,606 | -87,882 | 134,986 | 349,284 |
| | **$2.25** | **$2.75** | **$3.23** | **$3.75** | **$4.25** |

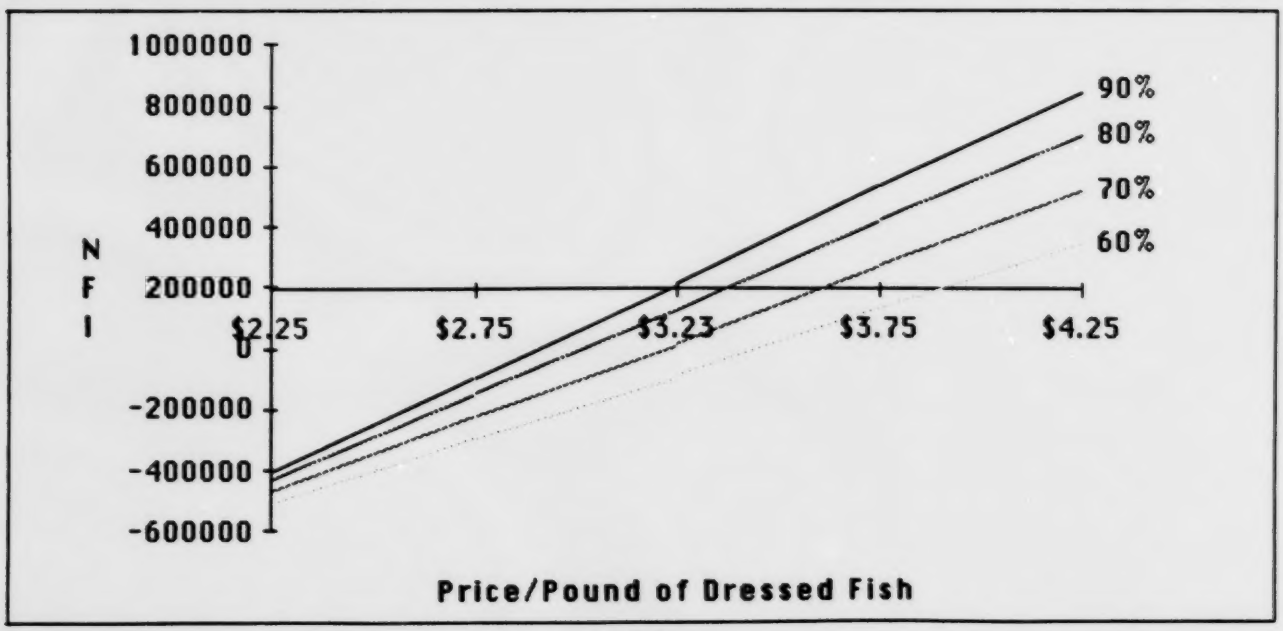
**Weighted Average Prices per Pound of Dressed Fish**

*The percent of fish surviving to market is calculated by dividing the number of fish sold by the number of smolts started times 100 to convert to percent.

The net farm incomes are calculated on the assumption that all costs reported in the study remain constant except for feed, feed delivery and transport, processing and marketing which are adjusted for changes in the amount of fish sold and in returns obtained.

**This is the net farm income realized for the consensus study farm. It is based on marketing 70% of the number of the fish started and at a weighted average price of $3.23 per pound of dressed fish.

Since the total opportunity costs specified by the participant group is $195,294, all net farm incomes below this figure would fail to achieve the specified opportunity costs. Conversely, the net farm incomes above $195,294. would exceed the opportunity costs. As can be seen , at a $3.23 per pound price, the opportunity cost is only exceeded when the percent of fish surviving to market is close to 90%. At a $3.75 per pound price the opportunity cost is exceeded when the percent of fish surviving to market is above approximately 64%. At a price of $4.25 the opportunity cost is exceeded even when the percent marketed is less than 60%. To place this is a visual perspective the following graph is provided.



The graph also illustrates the approximate prices at which the full opportunity cost is attained at varying levels of percent of fish surviving to market. The prices required to attain a net farm income which provides the $195,294 opportunity costs specified by the study participants are as follows: $3.21 at 90%, $3.35 at 80%, $3.60 at 70% and $3.89 at 60% of fish surviving to market.

**From the above it is clear that the viability of a salmon farm is highly dependant on relatively small variations in salmon price levels.**

**d) A Selected List of Analysis Ratios**

Although the ratios given below do not represent ideal standards, they may serve as examples of measures that could be helpful for salmon farm business analysis and planning.

Number of fish surviving to market / number of smolts placed 104,848 / 150,000 X 100 **70%**

Total capital investment / tonne of dressed fish sold $828,100. / 239.77 **$3,454.**

Net and seacage investment / tonne of dressed fish sold $595,600. / 239.77 **$2,484.**

Cubic metres of net space / tonne of dressed fish sold 72,000 / 239.77 **300.**

Number of smolts / tonne of dressed fish sold 150,000 / 239.77 **626.**

Net and seacage investment / total capital investment $595,600. / $828,100. **$.72**

Total capital investment / cubic metre of net space $828,100. / 72,000 **$11.50**

Net and seacage investment / cubic metre of net space $595,600. / 72,000 **$8.27**

Total capital investment / full time equivalent employee $828,100. / 4.5 **$184,022.**

Net and seacage investment / full time equivalent employee $595,600. / 4.5 **$132,356.**

Smolts / full time equivalent employee 150,000 / 4.5 **33,333.**

Tonnes of dressed fish sold / full time equiv. employee 239.77 / 4.5 **53.3**

Weighted average cost of feed / kilogram of feed fed $708,843. / 558,900 **$1.268**

Kilograms of feed fed / kilogram of live weight gain 558,900 / 310,450 **1.80**

Kilograms of feed fed / kilogram of live weight harvested 558,900 / 278,573 **2.01**

Kilograms of feed fed / kilogram of dressed fish sold 558,900 / 239,771 **2.33**